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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,995	12/05/2003	Bor-Wen Chan	24061.58 (TSMC2002-1399)	9115

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EXAMINER	
HU, SHOUXIANG	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 03/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/728,995	CHAN ET AL.
	Examiner	Art Unit
	Shouxiang Hu	2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) *7-15,24-27 and 34-36* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,16-23 and 28-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/08/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Claims 7-15, 24-27 and 34-36 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Papers dated 09/07/2004 and 12/13/2004.

Applicant's election with traverse of Group-I invention in Paper dated 09/07/2004 is acknowledged. The traversal is on the ground(s) that Group I and Group II inventions are not patentably distinct. This is not found persuasive because, as explained in the previous office action dated 08/18/2004, the inventions of Group I and Group II are distinct, as the product as claimed in Group I can be made by another process materially different than what is claimed in Group II; and they have acquired a separate status in the art as shown by their different classification; and the search required for Group I is not required for Group II.

The requirement is still deemed proper and is therefore made FINAL.

In addition, in both of the elections made in above two Papers, applicant did not further elect between the two species that further include: a chlorine-containing gas, and a bromine-containing gas, respectively, in the elected fluorine-containing chemistry. Such further election requirement was further required in each of the previous two office action. However, in order to expedite the prosecution of the application, applicant's non-compliance with such further election requirement is herby treated as an admission of

non-distinctive between the two species. Accordingly, both of the two species remain active in this Office action.

Accordingly, claims 1-36 are pending in this application; and, claims 1-6, 16-23 and 28-33 remain active in this office action

Specification

The disclosure is objected to because of the following informalities and/or defects:

In paragraph 0024, the specification discloses that a contact region 230 can be formed of salicide or silicide that is in contact with the polymer spacer as shown in Fig. 2. However, it is not clear how the polymer spacer could survive at the elevated temperature that is normally required during the formation of a silicide material.

Appropriate correction is required.

Claim Objections

Claims 1-6, 16-23 and 28-33 are objected to because of the following informalities and/or defects:

In claim 1, the term of "employing" should read as: --by employing--.

Claim 3 recites the subject matters that the substrate is formed of diamond and implies that the gate structure of the instant invention is formed thereon. However, the disclosure lacks an adequate description regarding how the recited diamond substrate is formed, and how the required semiconductor layer is formed thereon.

In claims 28-29, the term of "depositing" should read as: --the step of depositing--

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 5-6, 16-17, 20-23, 29 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu et al. ("Xu"; US 2004/0157457).

Xu discloses a method of manufacturing a microelectronic device (Figs. 1 and 12-16; and Table 1; also see paragraphs 0039, 0048, 0055 and 0083), comprising: forming a patterned feature (a gate structure; 1210 and/or 1215) over a substrate (1200); depositing a conformal polymer layer (1220) over the patterned feature and the substrate by employing a fluorine-containing plasma source (CF4); and etching the polymer layer to expose the patterned feature and a portion of the substrate, thereby forming polymer spacers on opposing sides of the patterned feature (see Fig.12E).

Regarding claim 17, the flow rate of the fluorine-containing chemistry in Xu can be between about 5 sccm and about 200 sccm (Table I).

Regarding claims 20-21, the fluorine-containing chemistry in Xu further includes

a bromine-containing gas (HBr; see paragraphs 0088-0081).

Regarding claims 22-23, the etching in Xu employs an oxygen-containing gas (O2; paragraph 0055).

Regarding claim 29, the step of depositing the polymer layer in XU employs a RF bias applied to the substrate at a power ranging between about 1 Watts and about 50 Watts (0038 and 0083).

Regarding claim 31, the etching of the spacer in Xu employs a RF bias applied to the substrate at a power of about 60 Watts (0048).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-4, 18-19, 28 and 30, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu.

The disclosure of Xu is discussed as applied to claims 1-2, 5-6, 16-17, 20-23, 29 and 31 above.

Regarding claims 3-4, Xu does not expressly disclose that the subdtrate can comprise diamond or strained silicon. However, it is noted that diamond is an art-known material for high strength and high stability applications; and that strained silicon is art-known for better channel performance. Therefore, it would have been obvious to one of

ordinary skill in the art at the time the invention was made to make a microelectronic device using the method of Xu with the substrate comprising diamond or strained silicon, so that a method for forming a microelectronic device with improved strength and stability and/or with improved channel performance would be obtained.

Regarding claims 18-19, Xu does not expressly disclose that fluorine-containing chemistry can further include a chlorine-containing gas such as Cl2 and Chlorocarbons. However, such chlorine-containing gas is also an art-known gas added for the formation of a fluorine-contained polymer. In addition, it is noted that, in view of applicant's arguments about the embodiments being non-distinctive, applicant's non-compliance with the further election requirement between the identified two species respectively with the two further comprised gases (a chlorine-containing gas, and a bromine-containing gas) is herby treated as an admission of non-distinctive between the two species, as explained in the electron/restriction section above in this office action. It is further noted that, should applicant traverse on the ground that the species are not patentably distinct, and if the examiner finds one of the inventions unpatentable over the prior art, the admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make a microelectronic device using the method of Xu with the further comprised gas being a chlorine-containing gas such as Cl2 and Chlorocarbons, so that a method for forming a microelectronic device with desirable

properties and/or improved material choice for the formed fluorine-contained polymer would be obtained.

Regarding claims 28 and 30, although Xu does not expressly disclose that the bias to the subdtrate can also be a DC bias, one of ordinary skill in the art would readily recognize that such DC bias is also an art-known bias method for achieving desirable process condition for forming and/or etching a polymer layer, as readily evidenced in the prior art such as Sivaramakrishnam et al. (US 5,958,510; see col. 2, lines 16-23; and col. 3, lines 44-50). And, it further noted that the bias power is an art-recognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make a microelectronic device using the method of Xu with the substrate bias being a DC bias with the recited bias power, so that a method for forming and/or etching the polymer film in the microelectronic device with desired and/or optimized process condition would be obtained.

Claims 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rupp et al. ("Rupp"; US 6,444,531) in view of Xu.

Rupp discloses a method of manufacturing a microelectronic device (Figs. 1-5), comprising: forming a patterned feature (4b, a gate structure) over a substrate (2); depositing a conformal polymer layer (8) over the patterned feature and the substrate; etching the polymer layer to expose the patterned feature and a portion of the substrate, thereby forming polymer spacers (10c and 10b) on opposing sides of the patterned

feature (see Fig.3); forming source/drain regions (12A AND 12B) in the substrate on opposing sides of the patterned feature; and, removing the spacers after forming the source/drain regions (Fig. 5).

Although Rupp does not expressly disclose that the polymer layer can be formed by employing a fluorine-containing plasma source, one of ordinary skill in the art would readily recognize that fluorine-containing plasma source is commonly used to form a polymer layer for forming sacrificial spacers with desirable properties, as evidenced in Xu, whose disclosure is discussed as applied to claims 1--6, 16-20-23, 28-29 and 30-31 above.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the forming and etching of fluorine-contained polymer of Xu into the method of Rupp, so that a method for forming a microelectronic device with desired properties for the sacrificial spacers would be obtained.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References C and D are cited as being related to the forming and etching of a polymer layer or polymer spacer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-

1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
March 17, 2005

SHOUXIANG HU
PRIMARY EXAMINER